

GE 348

ENGINEERING ECONOMICS

MIDTERM

FEBRUARY, 1997

- Open textbook
- One 8 1/2" x 11" sheet of notes
- Neatness counts a lot!
- Show all work in design note format

Question	Marks	Marks Obtained
1	10	10
2	10	10
3	15	15
4	15	10
5	25	25
6	25	25
	100%	95

NAME: Reid Jov Melle

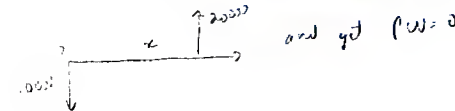
STUDENT #: 220616



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1. At an interest rate of amount?



(10)

$$P_1(1+i)^n = F_2$$

$$10000(1+0.05)^n = 20000$$

$$(1.05)^n = 2 \quad n \ln(1.05) = \ln 2$$

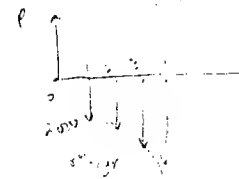
$$n = 9.01 \text{ years}$$

9.01

Answer

2. Tuition costs are expected to inflate at the rate of 8 percent per year. The first year's tuition is due 1 year from now and will be \$2000. A fund is to be set up today to cover tuition costs for 4 years in an account that will earn interest at rate i . How large must the fund be if $i = 5\%$?

(10)



note: P is a payment into the fund while tuition is a payment out

$$P - A_1 \left[\frac{1 - (1+i)^{-n}}{i} \right] = 0$$

$$P = 2000 \left[\frac{1 - (1+0.05)^{-4}}{0.05 - 0.08} \right]$$

$$P = 7951.84$$

7951.84

Answer

Name: Peter Miller
Student Number: 200516

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3. For a finance charge stated as 1.75 percent per month, what are the corresponding nominal and effective interest rates?

nominal rate = $(1.75) \times 12 = 21\%$

effective rate = $(1 + \frac{1.75}{12})^{12} - 1 = 23.14\%$

(15)

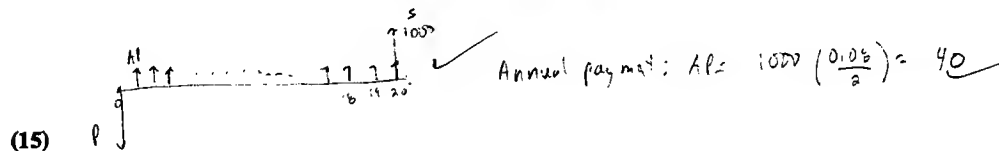
nominal: 21%

effective: 23.14%

a)	21.0%
b)	23.14%

Answer

4. A 10-year corporate bond has a face value of \$1000 and a coupon rate of 8 percent payable semiannually. A prospective buyer desires to earn a nominal rate of 12 percent on investments. What purchase price would the buyer be willing to pay?



set $PW=0$ to find breakeven at $MARR=12\%$

$$-P + A \left[\frac{(1+i)^n - 1}{i(1+i)^n} \right] + \frac{F}{(1+i)^n} = 0$$

$$-P + 40 \left[\frac{(1+0.06)^{20} - 1}{0.06(1+0.06)^{20}} \right] + \frac{1000}{(1+0.12)^{10}} = 0$$

$P = 780.77$

10

780.77

Answer

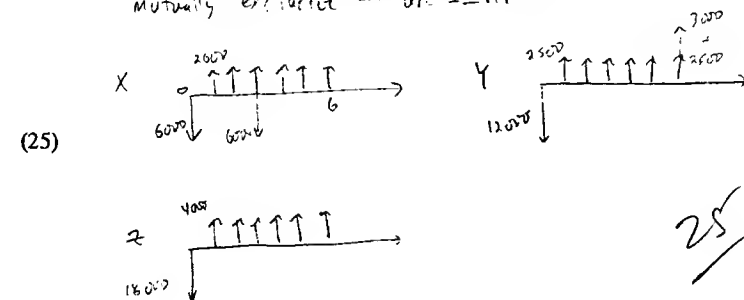
5.

Data for three alternative investment plans are listed below.

Alternative	Investment	Salvage Value	Life, Years	Annual Net Cash Flow
X	\$6,000	\$0	3	\$2600
Y	12,000	3000	6	2500
Z	18,000	0	6	4000

When the minimum attractive rate of return is 10 percent, which alternative should be selected if the individual alternatives are mutually exclusive?

Mutually exclusive \Rightarrow use IIR



set $PW=0$ in all cases

$$IIR_{0 \rightarrow X}: -6000 + 2600 \left[\frac{(1+i)^3 - 1}{i(1+i)^3} \right] - 6000(1+i)^{-3} = PW$$

try $i=10\%$ $PW = 815.79$ $\therefore IIR_{0 \rightarrow X}$ is $> MARR$ so take

$$IIR_{X \rightarrow Y}: -6000 - 1000 \left[\frac{(1+i)^6 - 1}{i(1+i)^6} \right] + 6000(1+i)^{-3} + 3000(1+i)^{-6} = PW$$

try $i=10\%$ $PW = -274.22 < 0$ $\therefore IIR_{X \rightarrow Y}$ is $< MARR$ so keep X

$$IIR_{X \rightarrow Z}: -12000 + 1400 \left[\frac{(1+i)^6 - 1}{i(1+i)^6} \right] + 6000(1+i)^{-3} = PW$$

try $i=10\%$ $PW = -1394.75 < 0$

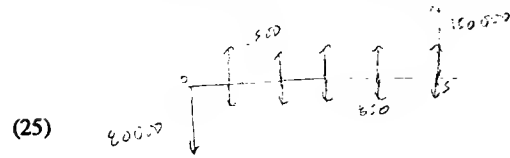
$\therefore IIR_{X \rightarrow Z} < MARR$ so keep X

X

Answer

Name: David Jon MillerStudent Number: 200616Name: David Jon MillerStudent Number: 200616

6. A parcel of land adjacent to a proposed highway exit is deemed likely to increase in value. It can be purchased now for \$80,000 and is expected to be worth \$150,000 within 5 years. During that period it can be rented for pasture at \$1500 per year. Annual taxes are presently \$850 and will likely remain constant. What rate of return will be earned on the investment if the estimates are accurate?



Find rate of return

set $PW = 0$ if possible

$$\text{annual income} = 1500 - 850 = 650$$

$$-80,000 + 650 P(P/A, i, 5) + 150,000 P(F, i, 5) = PW$$

$$-80,000 + 650 \left[\frac{(1+i)^5 - 1}{i(1+i)^5} \right] + 150,000 (1+i)^{-5} = PW$$

try $i = 20\%$ $PW = \text{negative}$ try $i = 10\%$ $PW = \text{positive}$

note solve $-80,000 + 150,000 (1+i)^{-5} = 0$ first as a guess

$$\Rightarrow i = 13.4\%$$

try $i = 13.4\%$ $PW = \text{positive}$ try $i = 13.5\%$ $PW = \text{positive}$ try $i = 13.7\%$ $PW = \text{positive}$ try $i = 14\%$ $PW = 134.6$ try $i = 14.1\%$ $PW = -209$

14 %

Answer

Bonus Question - Wealthy Barber

- 5% In point form, outline the principles recommended in the Wealthy Barber to financial independence.

- Dollar cost averaging - buy with same amount of money ✓
- Forced Savings ✓ get money taken out of account directly
- Insurance - only keep enough to sustain standard of living
 - don't keep any if you're single
 - decrease as you get old
- Real-estate is always a good long-term investment
- START EARLY ✓
- Always have a will
- Invest 10% of everything you make ✓
- Pay yourself first ✓
- Mutual funds are good and worth doing research into
- Equity outpays ~~just~~ = invest in a company rather than loan money
- Pay off high interest debt like credit cards = this is equivalent to making a good investment

use the Mutual Fund
to invest in the stock market
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